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Effect of GA_3 Spray on Gladiolus (*Gladiolus* spp.) Varieties under Dry Conditions of Vidharba Region

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ABSTRACT

Five varieties of gladiolus viz., Snow Princess, Princess Morgarate Rose, Yellow Stone, Novalux and American Beauty were used to study the response of GA_3 growth regulator under the Vidharba conditions of Maharashtra. The gibberellic acid with GA_3 concentrations (0, 100 and 200 ppm) were sprayed on plants at 30^{th}, 45^{th} and 60^{th} day after planting. Among five varieties, the variety American Beauty has recorded early sprouting (66.6 days), maximum number sprouts per plant(4.18), maximum height (58.78 cm) and maximum number of leaves (22) whereas, Princess Morgarate has recorded maximum leaf area (78.10 cm^2) under 200 ppm GA_3. The floral attributes showed that the variety Princess Morgarate Rose has recorded minimum days to first spike emergence (55.21 days), minimum days to opening of floret (64.83 days) and minimum days for 50% flowering (57.63 days) whereas, the variety Snow Princess has recorded maximum flowering span (26.12) and variety Yellow Stone has recorded maximum longevity of flowering on plant (15.68 days) also when sprayed with 200 ppm GA_3. In this regard the two varieties namely American Beauty and Princess Morgarate Rose showed superiority among all varieties with respect plant growth and flowering attributes respectively when sprayed with GA_3 at 200 ppm concentration.

Key words: *Gladiolus ssp., GA_3, Vegetative Growth, Flowering.*

INTRODUCTION

Gladiolus (*Gladiolus* spp.) is an important bulbous crop belongs to family *Iridaceae*, which is originated from South Africa. It is attributed as 'Queen of Bulbous ornamentals' due to its popularity among the bulbous ornamental cultivated in the world. This flower bears an economic and aesthetic value for its beauty and elegance. The long flower spikes are excellent as cut flower for ornamentation when arranged in vases.

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Gladiolus is grown as flower bed in gardens and used in floral arrangements for interior decoration as well as making high quality bouquets[10].

In India, it is commercially cultivated in West Bengal, Himachal Pradesh, Sikkim, Karnataka, Uttar Pradesh, Tamil Nadu, Punjab and Delhi over an area of 9.37 thousand ha with a production of 707 million spikes. Presently the crop is trading in domestic and international markets with great demand. Any attempt made to encourage cut flower production in the region not only helps the florists and consumers to get fresh and quality cut flowers regularly, but also helps the small and marginal farmers in the region to improve their economic condition[13].

In order to enhance the yield and quality of any flower crop several intercultural operations like good planting material, spacing, irrigation, plant protection etc., are necessary. The corms are important planting material which governs the growth and development of gladiolus. Inside the corms various physiological functions are triggered by plant growth regulators. The plant growth regulators are the organic chemical compounds which alters or regulate the physiological processes in plants. It has generally been accepted that many plant processes including senescence, are controlled through a balance between plant hormones interacting with each other and with other and with other internal factors[12]. Although growth retarding chemicals did not increase the number of flowers, they produced flowers with compact shape, developed short stalk, flowers remained fresh for a longer period and they suppressed the height of the plant[3]. With the known fact where the application of growth regulators such GA_3, NAA, CCC and MH had positive effects on growth and development of gladiolus plants at different concentrations several reports also indicate that the growth and yield of gladiolus was enhanced by application of plant growth regulators namely GA_3[17,28], NAA[15,26], CCC by Jinesh patel *et al*[9]., and MH by De *et al*[7]. Therefore, the present study was conducted in order to study the effect of GA_3 on growth, flowering and corm production of gladiolus (*Gladiolus* spp.) to find out the suitable varieties for the region.

MATERIALS AND METHODS

The present experiment was carried out at Horticulture unit, Department of Horticulture, College of Agriculture, Nagpur during *rabi* season of the year 2015-16. The location of experiment site was at latitude of 21º10' N and longitude of 79º19' E and with the elevation of 321.26 meters above the mean sea level. The experiment was laid out in factorial randomized block design with three replications and fifteen treatment combinations. The first factor including of five gladiolus varieties *viz.*, Snow Princess (V1), Princess Morgarate Rose (V2), Yellow Stone (V3), Novalux (V4) and American Beauty (V5) and second factor comprise of three foliar spraying treatments of GA_3 at G1 (Control), G2 (100 ppm) and G3 (200 ppm) respectively. Solution of plant growth regulators was sprayed as per the treatment along with control (water spray) at 30^{th}, 45^{th} and 60^{th} day after planting. The cold stored Gladiolus corms of above 5 cm diameter were procured and placed at room temperature for 15 days. The shade dried corms were planted at a spacing 45 × 15cm in raised beds. All the intercultural operations were followed as and when required. Randomly five plants were selected from each plot and labeled for the purpose of recording various growth parameters *viz.*, days for sprouting of corms, sprouts per plant, plant height, leaves per plant, leaf area, flowering parameters *viz.*, days to spike emergence, days for opening of first floret, longevity of flower on plant, flowering span and days for 50 per cent flowering (days). The mean value of the five selected plants from each treatment and the data was statistically analysed by the method suggested by Panse and Sukhatme[16].

RESULTS AND DISCUSSION

Growth parameters

In this parameter the varietal differences were significant in respect of days to sprouting of gladiolus (Table 1). For early sprouting significant results were observed in American Beauty (6.66 days) followed by Snow Princess (7.78 days), Novalux (8.67 days) and Princess Morgarate Rose (9.67 days), whereas, Yellow Stone took maximum days to sprouting (10.56 days). The effect of GA_3 on days to sprouting of gladiolus was found to be non-significant. The interaction effect in varieties and application GA_3 on number of days to sprouting of gladiolus was found to be non-significant. These findings are in correlation with Safiullah and Ahmad[21] and Chourasia *et al*[6]. Some varieties were significant with respect of number of sprouts per plant in gladiolus (Table 1). The variety American Beauty was found significantly superior over all varieties with maximum number of sprouts (4.12) followed by Novalux (2.28) which was found to be at par with Yellow Stone (2.06), Snow Princess (2.04) and Princess Morgarate Rose (1.96). The effect of GA_3 on number of sprouts per plant on gladiolus varieties were found to be non-significant. These findings are in close agreement with Bhujbal *et al*[4]., and Shaukat *et al*[24]. The height was found to be significant among the varieties of gladiolus (Table 1). The variety American Beauty has recorded maximum plant height (61.11 cm) which was statistically found to be at par with Novalux (58.78 cm). However, minimum plant height was recorded in the variety Princess Morgarate Rose (53.33 cm) which found to be at par with Snow Princess (54.78 cm) and Yellow Stone (56.78 cm). Similar results were obtained by Swaroop[27] and Bhujbal[4]. At the stage of 60 DAP, effect of GA_3 on plant height was found to be significant. Significantly maximum plant height was registered with treatment GA_3 200 ppm (64.26 cm) which was found to be on par with treatment GA_3 100 ppm (62.19 cm), whereas, minimum plant height was recorded in the control treatment (57.97 cm). Similar results were also obtained by Maurya and Nagada[11] and Sajjad[22]. The interaction effect due to different varieties and GA_3 on plant height of gladiolus was found to be non-significant at all the growth stages. The variety American Beauty has recorded significantly highest leaves per plant (22) followed by Novalux (15.17) and Yellow Stone (11.83) which was found to be at par with Snow Princess (11.56) (Table 1). However, minimum leaves per plant were recorded in the variety Princess Morgarate Rose (10.7). These findings are in close agreement with the findings of Bhujbal[4] and Chourasia[6]. Whereas the interaction effect due to different varieties and GA_3 on leaves per plant of gladiolus was found to be non-significant. The significantly maximum leaves per plant were observed in the treatment GA_3 @200 ppm (14.8) which was statistically found to be at par with the treatment, GA_3@100 ppm (14.6), whereas, minimum leaves per plant were observed in the control treatment (13.37). Similar findings were observed by Sable *et al*[20]., and Aier *et al*[1]. In variety Princess Morgarate Rose maximum leaf area was found to be significant which was superior over all varieties (78.10 cm^2) which was found to be at par with American Beauty (76.71 cm^2), Yellow Stone (76.18 cm^2) and Snow Princess (75.31 cm^2). However, minimum leaf area was observed in the variety Novalux (60.23 cm^2) (Table 1). The variation in the leaf area of gladiolus varieties might be attributed due to the genetic differences of the varieties used, as the most of the characters are governed by the genetic makeup of the plant. These findings can be correlated with Naresh *et al*[13]. The treatment GA_3 @ 200 ppm recorded maximum leaf area (76.34 cm^2) whereas, control treatment recorded minimum leaf area (70.34 cm^2) which was found to be at par with GA_3 @100 ppm (73.33 cm^2). The interaction effect due to different varieties and GA_3 on leaf area of gladiolus was found to be non-significant. Flowering parameters significantly early spike emergence was observed in Princess Morgarate Rose (55.21 days) which was statistically found to be at par

with Snow Princess (55.23 days) (Table 2). These findings can be correlated with Shriramagond and Hanamashetti[25] and Safifullah and Ahmad[21] in gladiolus. The treatment GA_3 @ 200 ppm recorded early spike emergence (57.95 days) which was found to be at par with the treatment GA_3 @ 100 ppm (59 days), whereas, control treatment was taken maximum days for spike emergence of gladiolus (61.91 days). Interaction effect due to different varieties and GA_3 on number of days to spike emergence of gladiolus was found to be non-significant. This might be due to increased vigour of plant and enhanced vegetative growth due to the treatment of gibberellic acid. These findings can be correlated with Kumar *et al*. and Chopde *et al*[5]. Significantly early floret opening was observed in Princess Morgarate Rose (64.83 days) which was statistically found to be at par with Snow Princess (65.54 days) (Table 2). However, American Beauty took maximum days to openingof first floret (72.28 days) which was found to be at par with Yellow Stone (70.89 days) and Novalux (69.52 days). These findings can be correlated with Poon *et al*[18]., and Archana and Patil[2]. The treatment GA_3 @200 ppm was recorded minimum days to opening of first floret (66.5 days) which was found to be at par with the treatment GA_3@100 ppm (67.17 days), whereas, control treatment had taken maximum days for opening of first floret (61.91 days). The interaction effect due to different varieties and GA_3 on number of days to opening of first floret was found to be non-significant. These findings can be correlated with Aier *et al*[1]., and Rani *et al*[19]. In variety Princess Morgarate Rose has significantly taken variety Novalux took maximum days to 50 % flowering (64.43 days) which was found to be at par with Yellow Stone (64.29 days), Snow Princess (63.41 days) and American Beauty (63.33 days). The interaction effect due to different varieties and GA_3 on number of days to 50 % flowering in gladiolus was found to be non-significant (Table 2). These findings can be can be correlated with Bhujbal *et al*[4]. These findings can be correlated with Dogra *et al*[8]., and Sarkar *et al*[23]. Variety Snow Princess has significantly recorded maximum flowering duration (26.12 days) which was found to be at par with Princess Morgarate Rose (23.67 days) and Novalux (23.07days) (Table 2). However, variety American Beauty has recorded minimum flowering duration (18.87 days) which was found to be at par with Yellow Stone (20.43 days). These findings can be correlated with Chourasia *et al*[6].The treatment GA_3 @ 200 ppm was recorded significantly maximum flowering duration (24.52 days), whereas, control treatment has recorded minimum flowering duration (20.75 days) which was found to be at par with the treatment GA_3 @ 100 ppm (21.99 days) in gladiolus. The interaction effect due to different varieties and GA_3 on flowering span in gladiolus was found to be non-significant. These findings can be correlated with Neetu *et al*[14]. Variety Yellow Stone was recorded significantly maximum longevity of flower spikes (15.68 days) which was statistically found to be at par with variety Snow Princess (15.10 days) followed by Princess Morgarate Rose (14.32 days). However, variety American Beauty was recorded minimum longevity of flower spikes (12.92 days) (Table 2). These findings can be correlated with Chopde *et al*[5]. The treatment GA_3 @ 200 ppm was recorded maximum longevity of flower spike (14.99 days) which was found to be at par with GA_3 @ 100 ppm (14.64 days), whereas, control treatment was recorded minimum longevity of flower spike (13.71 days) of gladiolus. An increase in longevity of gladiolus spike with the application of GA_3 might be due to more vegetative growth, early spike emergence, increased length of spike and rachis and more florets per spike which might have helped the spikes to last longer on plant in the field. These findings are in conformity with the findings of Chopde *et al*[5]. The interaction effect due to different varieties and GA_3 on longevity of spikes of gladiolus was found to be non-significant.

Table 1: Effect of GA_3 on growth parameter of different gladiolus varieties

Treatments	Days for sprouting of corms	Number of sprouts per plant	Plant height	Number of leaves per plant	Leave area
First factor- Varieties (V)					
V1 (Snow Princess)	07.78	2.04	54.78	11.56	75.31
V2 (Princess Morgarate Rose)	09.67	1.96	53.33	10.70	78.10
V3 (Yellow Stone)	10.56	2.06	56.78	11.83	76.18
V4 (Novalux)	08.67	2.28	58.78	15.17	60.23
V5 (American Beauty)	06.65	4.12	61.11	22.00	76.71
SE(m) ±	0.27	0.16	1.25	0.39	1.37
CD at 5 %	0.78	0.47	3.63	1.13	3.96
Second factor – Gibberellic acid (G)					
G1 (Control)	08.77	2.26	55.40	13.37	70.34
G2 (GA3 100 ppm)	08.49	2.71	56.87	14.60	73.23
G3 (GA3 200 ppm)	08.73	2.5	58.60	14.80	76.34
SE(m) ±	0.21	0.16	0.97	0.30	1.06
CD at 5 %	-	-	-	0.87	3.07
Interaction effect V X G					
SE(m) ±	0.57	0.36	2.66	0.83	2.91
CD at 5 %	-	-	-	-	-

Table 2: Effect of GA_3 on different gladiolus varieties for floral attributes

Treatments	days to spike emergence	days for opening of first floret	Days for 50 per cent flowering	Flowering span	Longevity of flower on plant
First factor- Varieties (V)					
V1 (Snow Princess)	55.23	65.54	63.41	26.12	15.10
V2 (Princess Morgarate Rose)	55.21	64.83	57.31	23.61	14.32
V3 (Yellow Stone)	62.99	70.89	64.29	20.43	15.68
V4 (Novalux)	63.06	69.52	64.43	23.07	14.22
V5 (American Beauty)	61.61	72.28	63.33	18.87	12.92
SE(m) ±	1.04	1.15	1.15	1.05	0.30
CD at 5 %	3.03	3.35	3.32	3.05	0.88
Second factor – Gibberellic acid (G)					
G1 (Control)	61.91	72.17	64.83	20.75	13.71
G2 (GA_3 100 ppm)	59.00	67.17	61.61	21.99	14.64
G3 (GA_3 200 ppm)	57.95	66.50	61.23	24.52	14.99
SE(m) ±	0.81	0.89	0.89	0.81	0.23
CD at 5 %	2.34	2.59	2.57	2.36	0.68
Interaction effect V X G					
SE(m) ±	2.22	2.45	2.43	2.23	0.64
CD at 5 %	-	-	-	-	-

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